Case Studies on Technologies

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ACWA Nutrients Permitting Workshop June 5-7, 2018

Presentation Outline

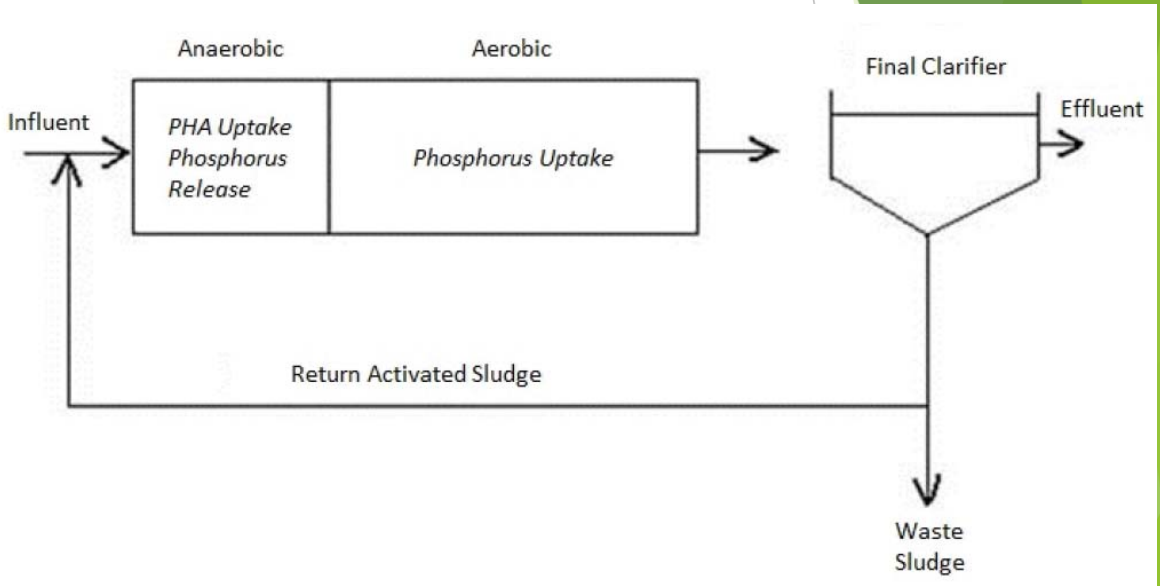
- Phosphorus Rule Background
- Traditional Tertiary Treatment
- Emerging Technologies
  - Chemicals
  - Advanced Biological Nutrient Recovery (ABNR)

Phosphorus Rule Background

- Technology Based Effluent Limits (TBELs) established 1993
  - 1.0 mg/L or Alternative Phosphorus Limit (APL)
- Discharge Thresholds
  - Industries >60 lbs/month
  - Municipalities >150 lbs/month
- Chapter NR 217 Subchapter II, Wis. Adm. Code

TBEL Technology

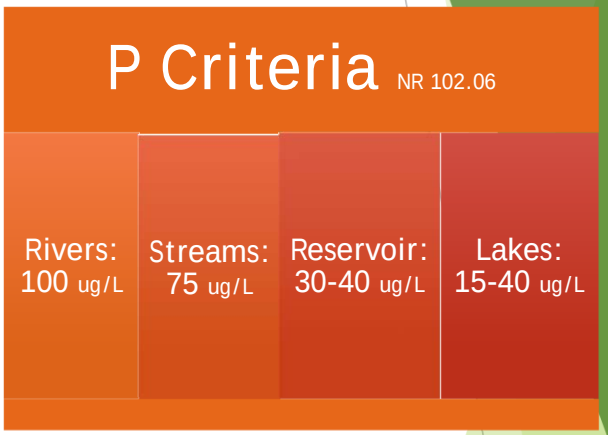
- Biological Phosphorus Removal
- Chemical Precipitation



$$Al_2(SO_4)_3 \cdot 14H_2O + 2PO_4^{3-} \rightarrow 2AlPO_4\,(\downarrow) + 3SO_4^{2-} + 14H_2O$$

Phosphorus Rule Background

- Revisions to Phosphorus Water Quality Standards became effective December 1, 2010
- Water Quality Based Effluent Limits (WQBELs)
- All Surface Water Dischargers
- Permittees receive a compliance schedule of 7-9 years

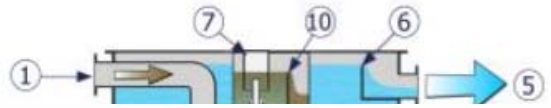


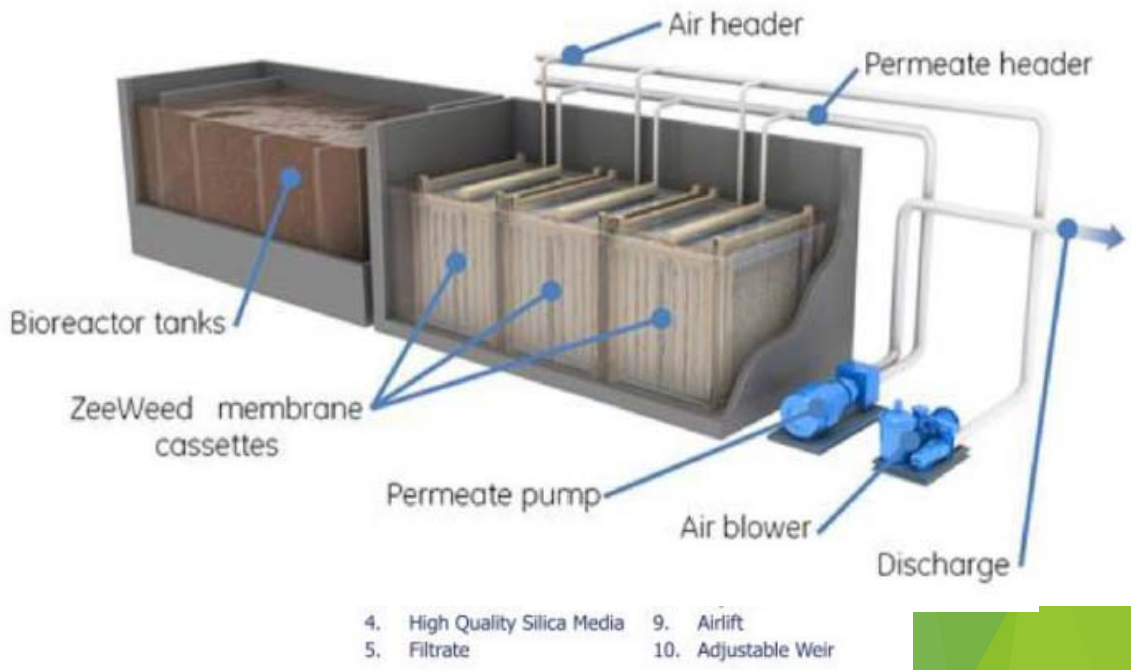
Compliance Alternatives

- Brick & Mortar Upgrade (Treatment Technology)
- Watershed Options
  - Adaptive Management
  - Water Quality Trading
- Variances
  - Multi-Discharger Variance
  - Individual (site-specific) Variance

Traditional Tertiary Treatment

- Ultrafiltration
- Cloth Disc Filters
- Continuous Backwash Sand Filters
- Membrane Bioreactors





Emerging Technologies

- Chemicals
  - Rare Earth Metals
  - Polyaluminum Chloride
- Advanced Biological Nutrient Recovery (ABNR)

CHEMTRADE

CLEARAS WATER RECOVERY

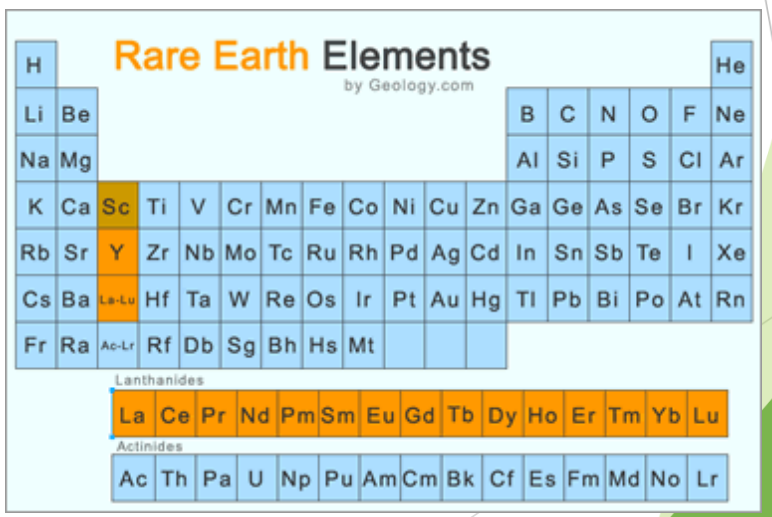
Molycorp sorbx 100

RE300 RARE EARTH TECHNOLOGY

MSW MULCAHY SHAW WATER

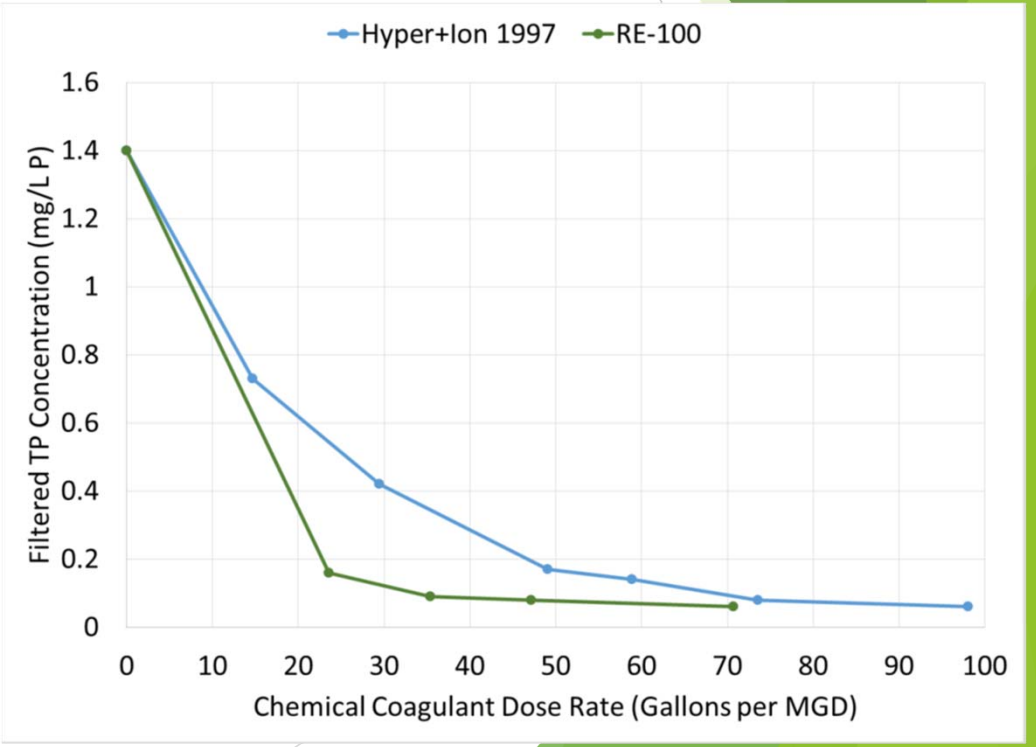
SorbX/RE300

- Rare Earth Coagulant: La/CeCl3
- Potential Toxicity
  - WET Testing
- Biosolids Metal Interference
  - Arsenic, Selenium
- Low Freezing Point
- $$$



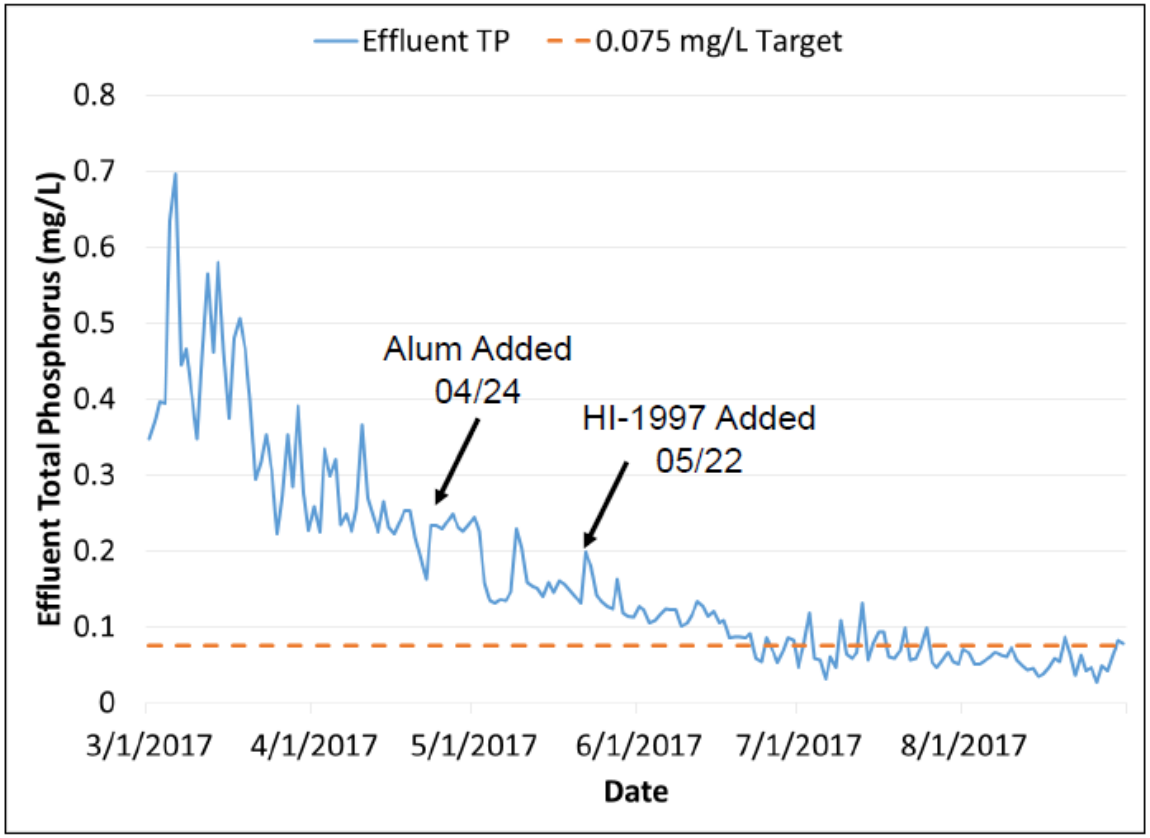
Polyaluminum Chlorides

- No toxicity issues or interference
- Increased settling
- Lower cost
- Higher the aluminum concentration, less volume required



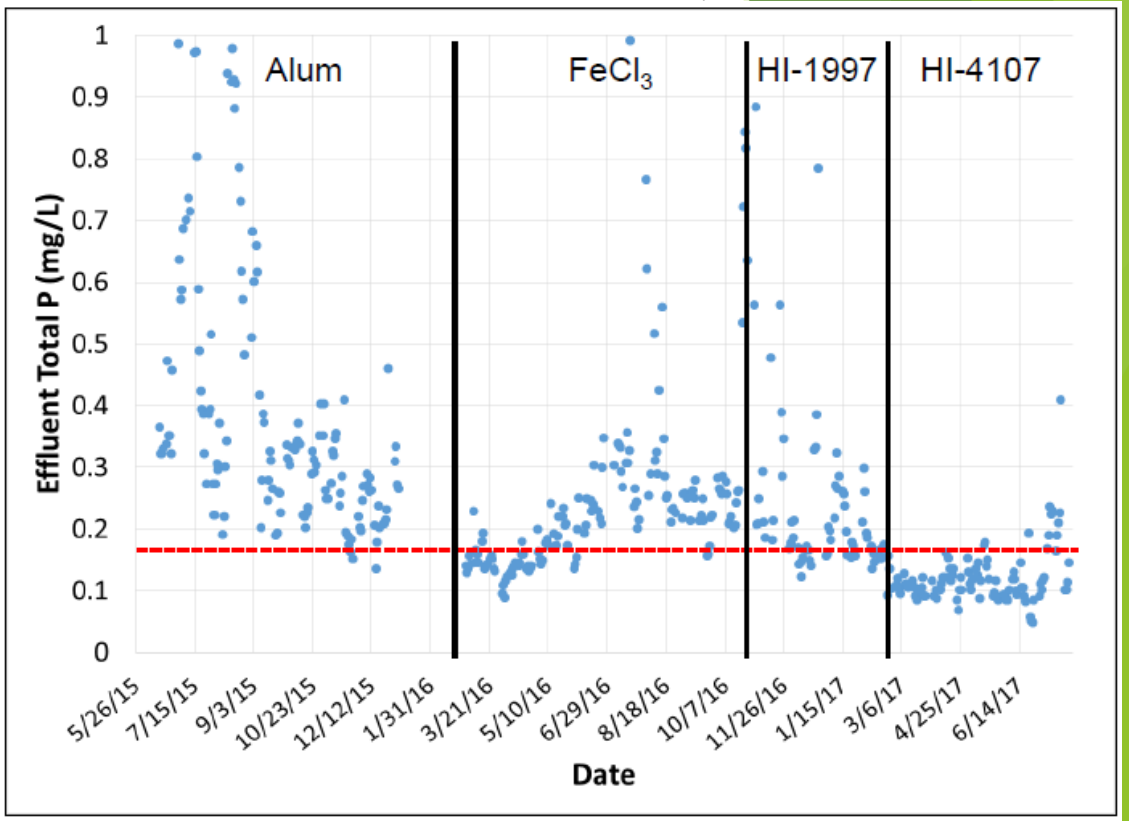
Slinger, WI

- Treats 1-2 MGD flow
  - No primary clarifiers
- Oxidation Ditch w/Bio-P
- Haven't tested in winter months



Neenah-Menasha WWTP

- Treats 8-10 MGD flow
- Primary Clarification w/ extended aeration



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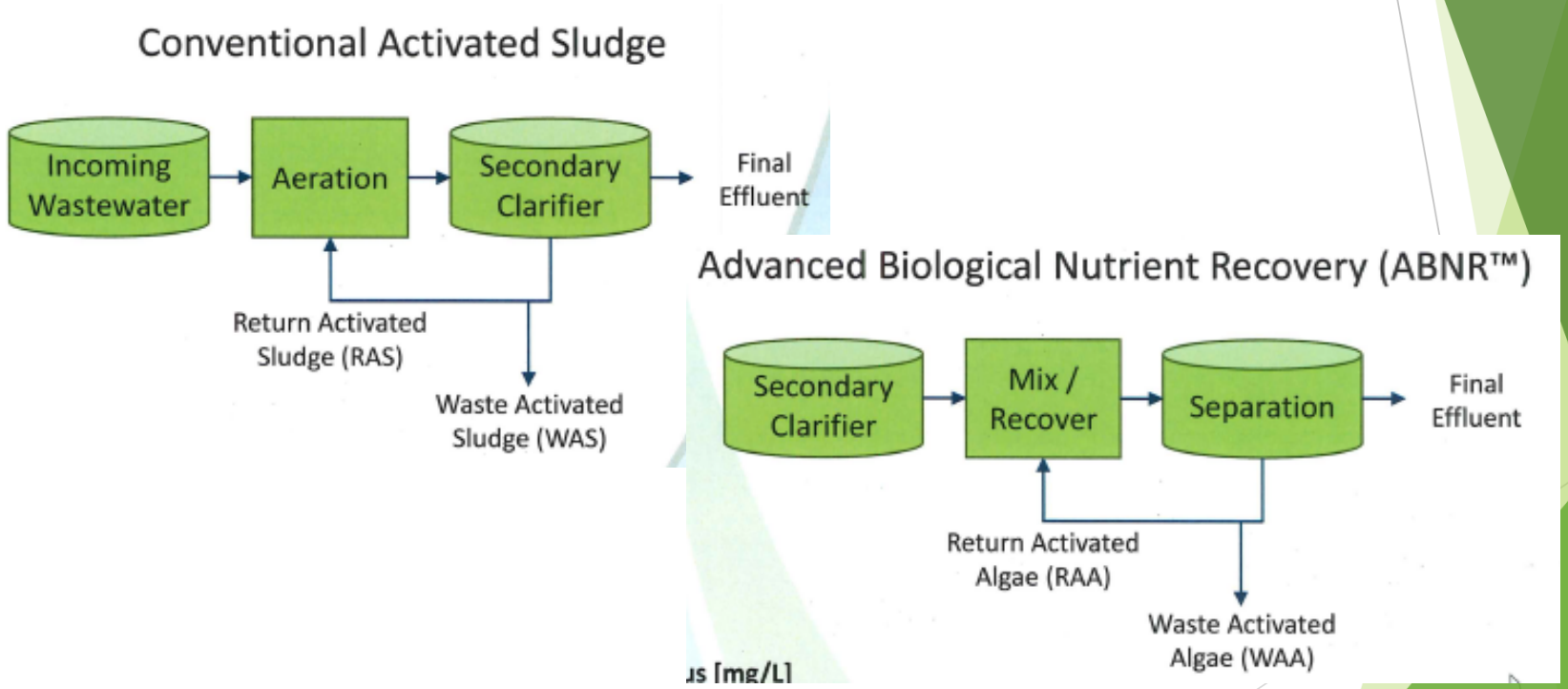
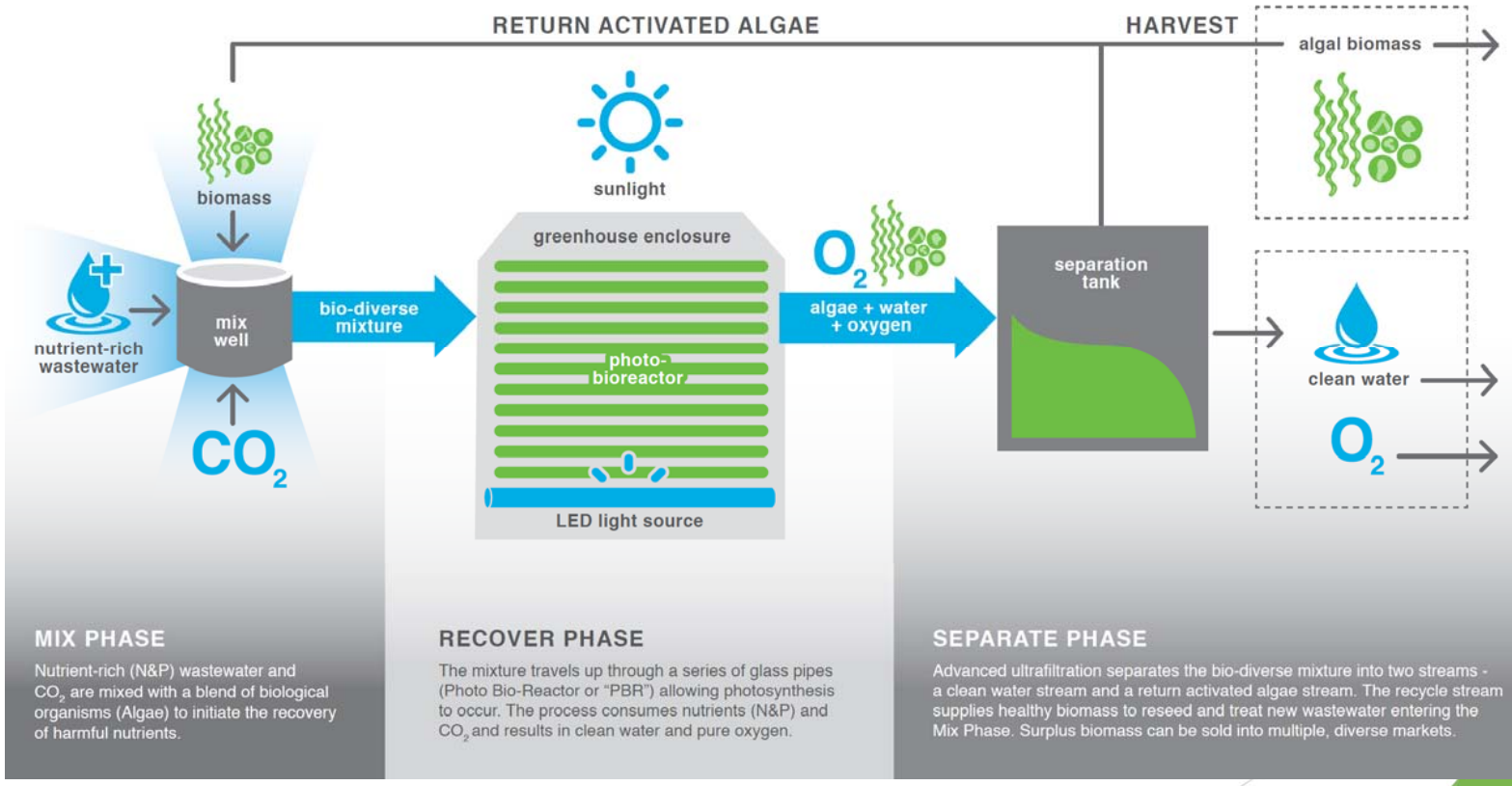
Mimic Traditional Activated Sludge Systems



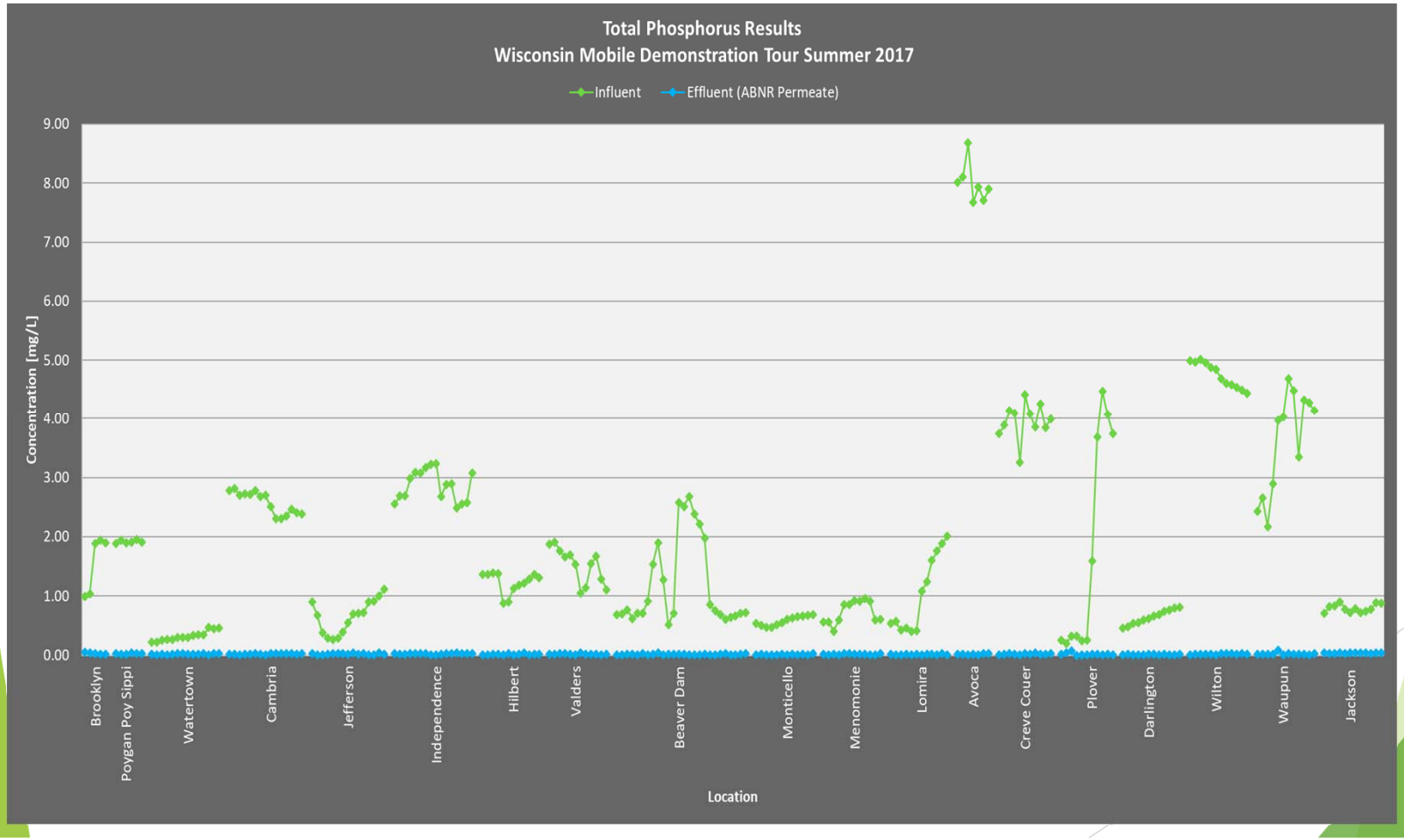
ABNR TECHNOLOGY PROCESS FLOW DIAGRAM



Biosolids - Algal Biomass

- Biomass hauled ~1/week
- ClearAs manages all activities – 20 year contracts
- Current pay $0.50-$1/lb dry weight
  - 5-year locked rates

WISCONSIN PERFORMANCE – PHOSPHORUS

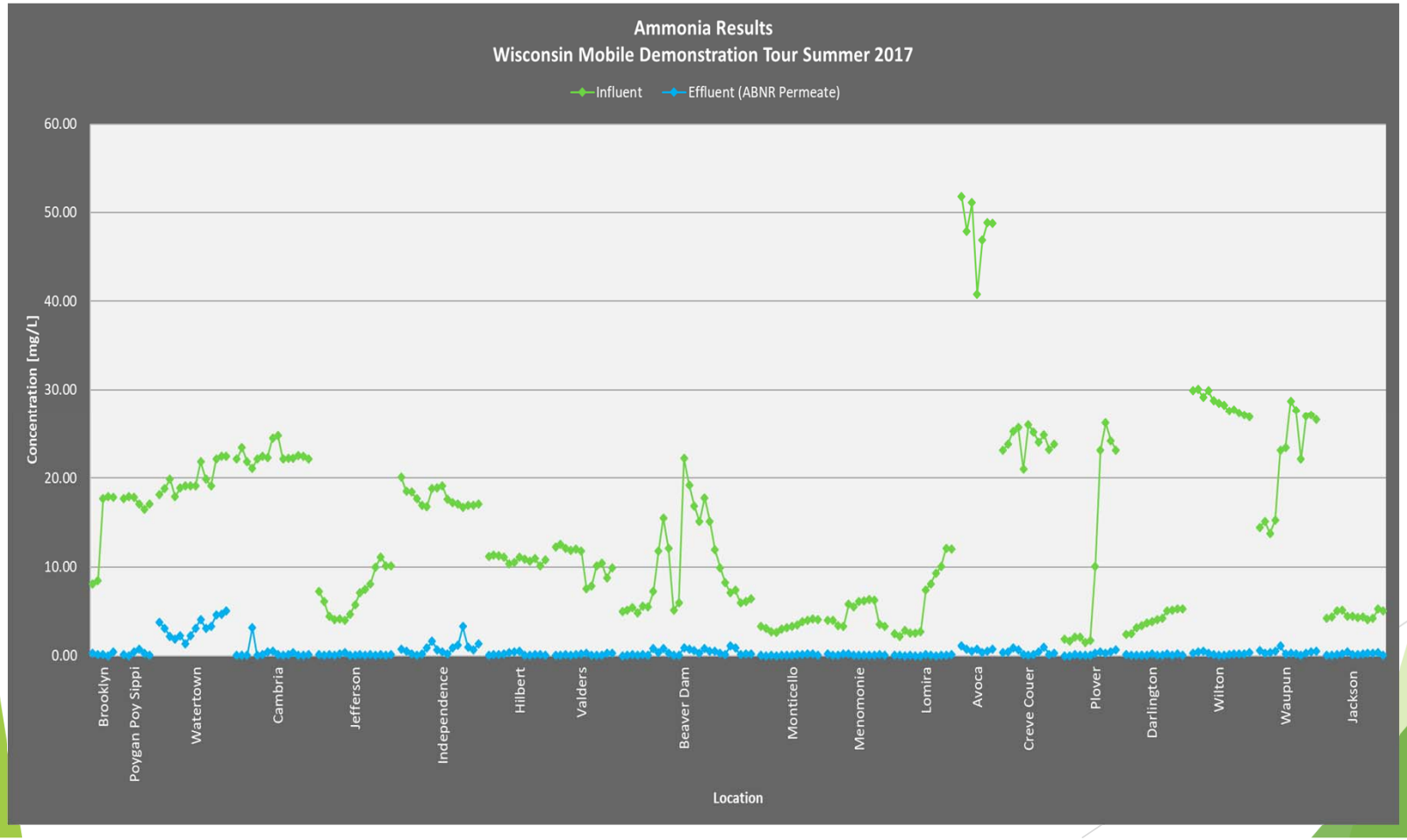


Data set includes 234 separate trials (19 WWTFs).

Average incoming phosphorus = 1.91 mg/L

Average treated phosphorus = 0.02 mg/L

WISCONSIN PERFORMANCE – NITROGEN

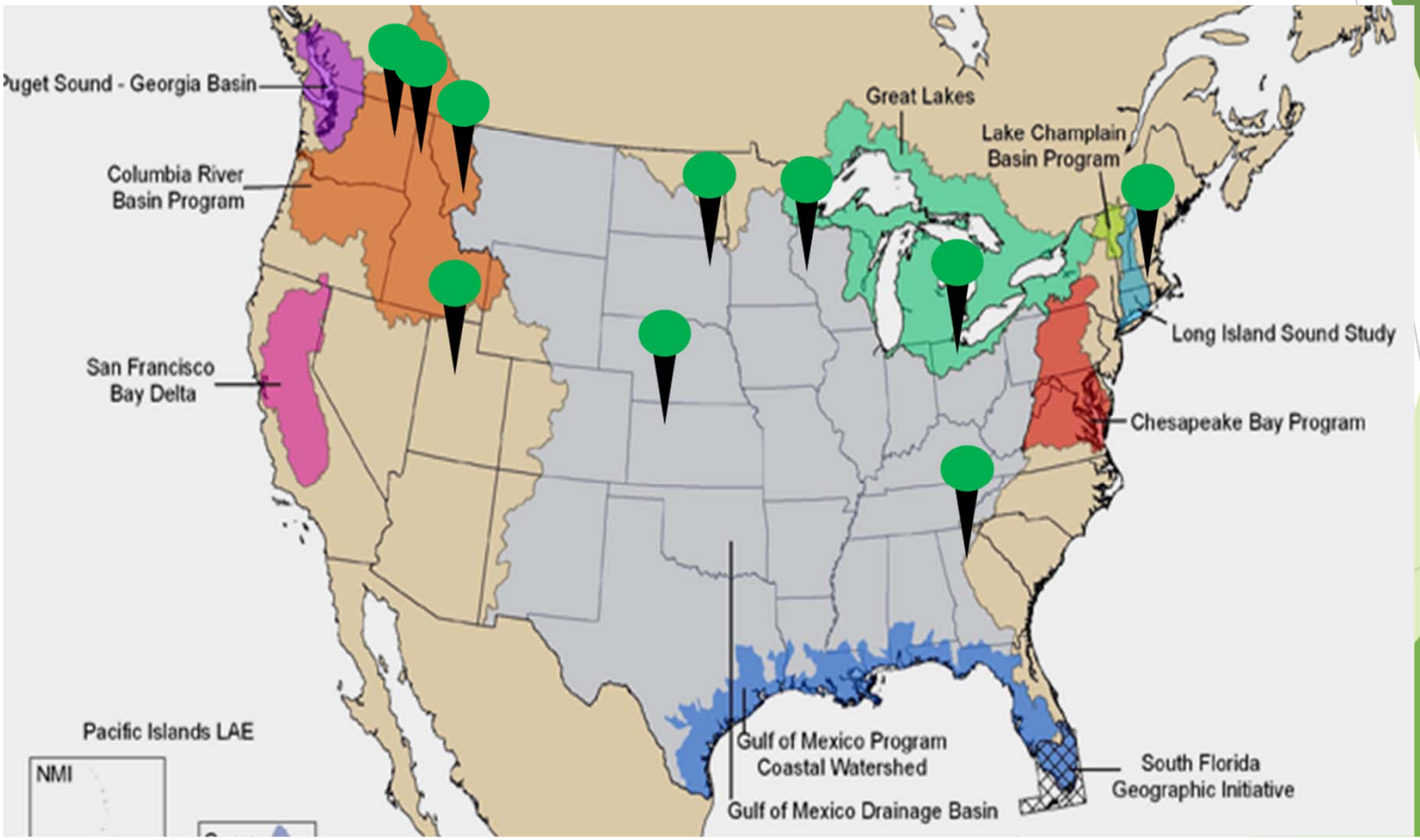


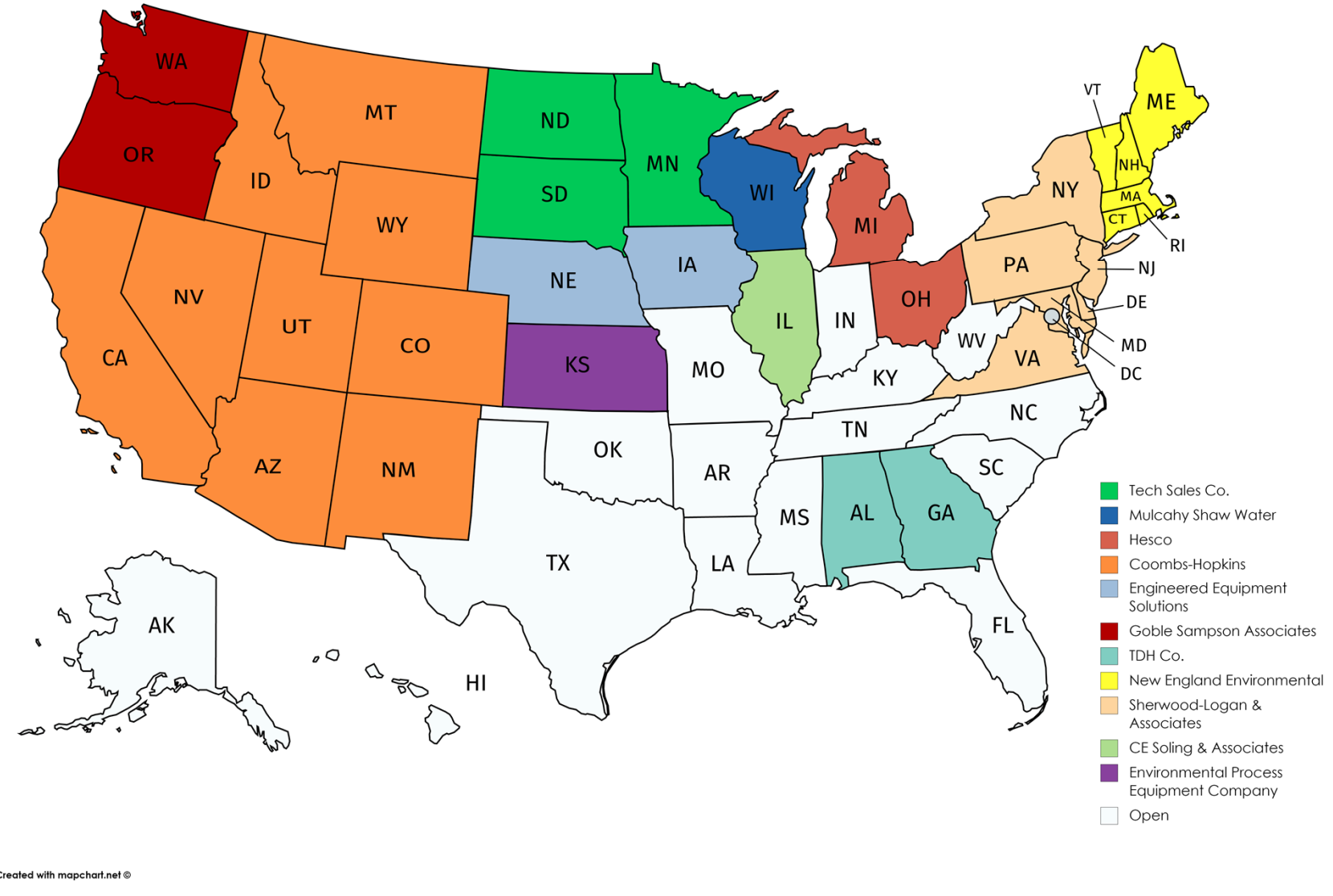
Data set includes 234 separate trials (19 WWTFs).

Average incoming ammonia = 14.09 mg/L

Average treated ammonia = 0.49 mg/L

ClearAs Experience - Demonstrations

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Questions?

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